Squeezing More Performance Out of a Conventional High Power converter for Renewable Energy Integration

Ghanshyamsinh Gohil
Post-Doctoral Researcher with the FREEDM Systems Center,
North Carolina State University, Raleigh

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Abstract: Two-level Voltage Source Converter (VSC) is commonly used in many power electronics applications and often connected in parallel to realize medium/high power converter systems. The Silicon Insulated Gate Bipolar Transistors (IGBTs) are normally used in such applications and they suffer from excessive losses if the switching frequency is increased beyond few kHz. Due to this limitation, large harmonic filters are required in order to meet the stringent power quality requirements imposed by the utility. Large filter components could lead to higher losses and lower power density. The contradictory requirements of the low switching losses and small filter size can be achieved by improving the harmonic quality of the switched output voltage. For a given switching frequency, this can be achieved using the multi-level converters. This presentation discusses method of achieving multi-level voltage waveforms from conventional parallel connected two-level VSCs. The associated issues related to the circulating current and harmonic quality are described and suitable solutions are proposed. The advantages and drawbacks of the proposed solution are illustrated. Performance of the proposed solution is also compared with that of a futuristic Silicon Carbide (SiC) based power converter.

Biography: Ghanshyamsinh Gohil received the Master of Technology degree in electrical engineering with specialization in power electronics and power systems from Indian Institute of Technology-Bombay, and PhD degree in power electronics from Aalborg University in Denmark in 2011 and 2016, respectively. Prior to joining PhD, he was with Siemens Corporate Technology where he worked on the hybrid AC/DC Micro-Grid project. He also worked on the PV systems and the power quality issues during his employment at Crompton Greaves Global R&D center. He is currently working as a Post-Doctoral Researcher with the FREEDM Systems Center, North Carolina State University, Raleigh, where his focus is on applications of wide band gap devices in power electronics and grid modernization. His research interests include applications of wide band-gap devices, smart energy systems, medium voltage dc-dc conversion, and design of the medium frequency inductive power components.